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VOLUME XLVII OCTOBER, 1948 NUMBER 7

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National Council at Work . *Thomas F. Barton*

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Dr. Lemert is Professor of Geography at Duke University and has spent many seasons in field studies in Mexico. Numerous articles by him appeared in previous issues of the JOURNAL. Teachers will find a collection of his writings very helpful in their work on Mexico.

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Mrs. Blouch is a teacher in the Hayes School, Lakewood, Ohio. She is especially interested in travel, and field trips for children and the use of visual aids as substitutes. Articles dealing with this phase of her teaching will appear in future issues of the JOURNAL.

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VOLUME XLVII OCTOBER, 1948 NUMBER 7

THE UNITED STATES TRUST TERRITORY OF THE PACIFIC ISLANDS

JOHN WESLEY COULTER
University of Cincinnati

When Uncle Sam took over the government of the islands in Micronesia formerly mandated to Japan, he began to wrestle with problems some of which are difficult to solve. Thousands of native people in hundreds of small, scattered islands demand food, shelter, medical attention and a standard of living at least as high as they enjoyed under the Japanese. They look for a type of administration in which they will play some part. At the same time Uncle Sam is concerned with security problems in these specks of land far flung from the United States, and with the type of government they shall have in the future.

Micronesia includes the Mariana, Caroline and Marshall archipelagoes, all of which with the exception of Guam were assigned to Japan under a League of Nations mandate after World War I. The Gilbert islands, also in Micronesia, are part of the British Gilbert and Ellice Islands colony. Both Guam and the Gilberts were seized by the Japanese soon after their raid on Pearl Harbor.

Toward the end of World War II various islands in Micronesia, including the Gilberts, were captured and occupied by the armed forces of the United States. The Gilbert Islands were returned to Great Britain. The former mandated islands are now "The United States Trust Territory of the Pacific Islands."

Comprising the Marianas, the Carolines (with the Palau Group, part of them), and the Marshalls, the Territory of the Pacific Islands includes at least 2,000 islands and islets, if every dot of land is included which is not submerged at high tide. If only atolls and main islands are listed the following tables give their number and area.

TABLE I

ATOLLS AND ISLANDS IN U. S. TRUST TERRITORY

	No. Atolls and Main Islands	area in sq. miles
Marianas (exc. Guam)	14	247
Western Carolines	6	185
West Central Carolines	16	90
East Central Carolines	14	61
Eastern Carolines	10	189
Marshalls	33	74
	93	846

TABLE II

OTHER ATOLLS AND ISLANDS IN MICRONESIA

Guam	1	225
Nauru and Ocean Island	2	14
Gilbert Islands	16	166
	19	405
Grand Total	112	1251

Lying between the equator and 21° north latitude and between 131° and 173° east longitude, archipelagoes and isolated islands are widely separated in an ocean area two-thirds the size of the United States.

NATURAL ENVIRONMENT

The islands of Micronesia have various origins. Many, like the Marshalls, are coral atolls less than the height of a man above sea level. The Marianas and some of the Carolines are volcanoes built up steeply from vents in the ocean floor. A few of them rise several thousand feet above sea level. Some islands have complicated structures due to the action of several earth-building agencies. All are surrounded by coral reefs. Volcanic islands intercepting the trade winds have a heavy rainfall on their windward slopes. The surfaces of the older ones have been weathered into fertile soils where taro, yams, and other native vegetables flourish. Coral atolls conform to the same well defined type, namely a roughly circular or horseshoe-shaped fringe of low islets about a central lagoon. Fragments of dead coral are found above the sea level by the action of tide, wind and wave and form land surfaces only a few feet high. Atolls support little vegetation other than coconut and

pandanus trees and, in hollows, where there is meager soil, a few coarse, edible tubers. On all inhabited islands the coconut palm furnishes the natives with food and artifacts used in their domestic economy; and copra, the dried meat of the nut, is exported.

Since Micronesia lies within the tropics the climate is characterized by a uniformly warm temperature and on most islands by considerable variation in rainfall. In general the nearer the islands

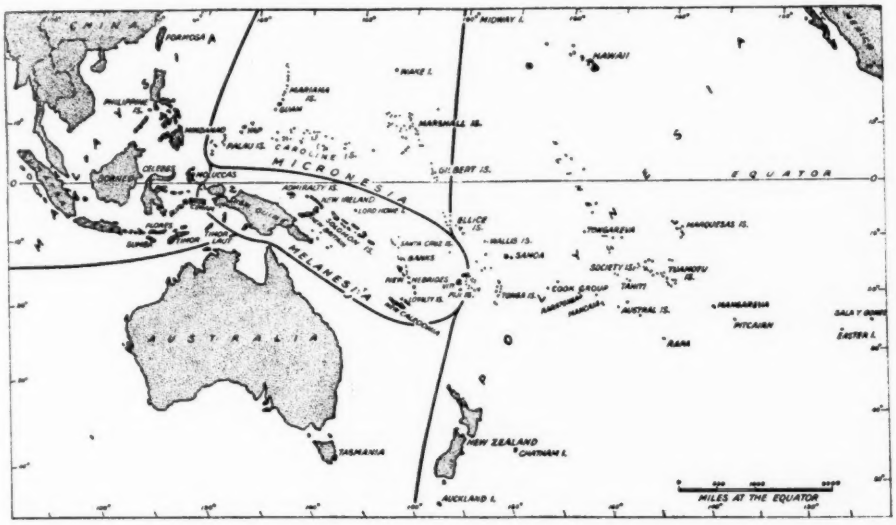

FIG. 1. Map of the Pacific islands showing Micronesia, Melanesia, and Polynesia.

are to the equator, the more uniform is the temperature. In the Marshall islands the mean monthly temperature varies no more than one or two degrees from an annual mean of about eighty-one. The daily variation, however, is from five to ten degrees. The genial climate of Micronesia is occasionally interrupted by hurricanes—terrific wind and rain storms which leave ruin in their wake. Generally only one island in a group is laid waste and the natives of those which have escaped take food to devastated islands.

The Pacific Ocean is the most important natural feature of the island home of the Micronesians. It not only tempers the climate, but it has furnished them slow but their only means of communication between islands and between island groups. Its wide, rolling expanse kept the archipelagoes isolated from the outside world for thousands of years, and allowed the natives to develop

their own lives and customs in their own way. The great isolation which the ocean imposes is partly compensated for by the abundance of fish which it generally affords these island people.

THE PEOPLE

Uncle Sam's new nephews and nieces are not a homogenous group, but represent several ethnic groups, each of which has its own language and customs which differ more or less from those of

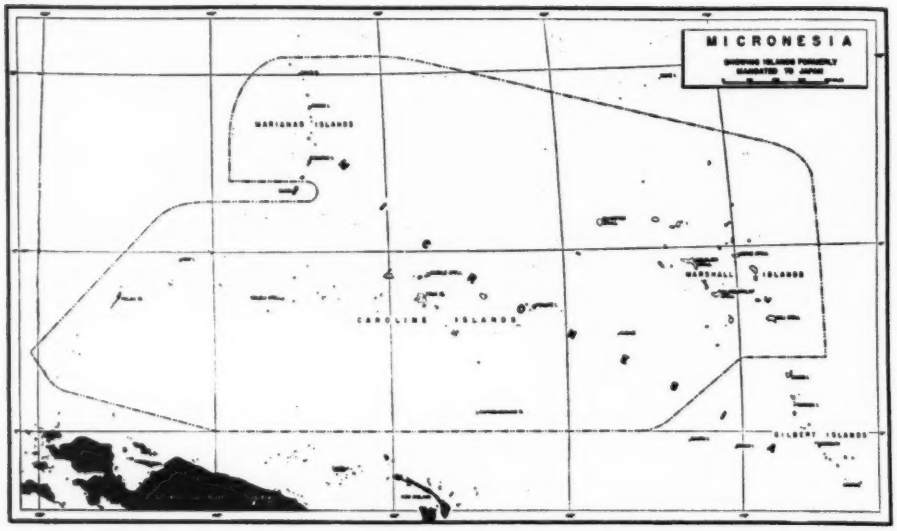

FIG. 2. The United States Trust Territory of the Pacific Islands (surrounded by broken line). These were formerly Japanese mandated islands.

the others. For easy classification they are divided into two groups: the Chamorros of the Marianas islands, and those who have been derogatorily termed the "Kanakas" who live in the Carolines and Marshalls. The people of Guam, with the exception of the recent Japanese occupation, have been under the government of the United States since the Spanish-American War. That island has now returned to its pre-war standing, the *status quo ante bellum,* as our diplomats say. About 50,000 natives live in the former mandated islands and 22,783 in Guam.

The Guamanians are higher in our idea of the civilized scale of native people than the inhabitants of the Carolines and Marshalls. Forcibly Christianized by the Spanish and governed by them for three hundred years before they came under the rule of

the United States, they understand western manners probably better than any other native people in the Pacific, except the Hawaiians and the Maoris of New Zealand. Furthermore, they have some admixture of Caucasoid (Spanish), Malayan and Mongoloid blood, the last two of which stem from their proximity to the Philippines and China.

The appearance of town and countryside in Guam before World War II reflected the different western influences to which the

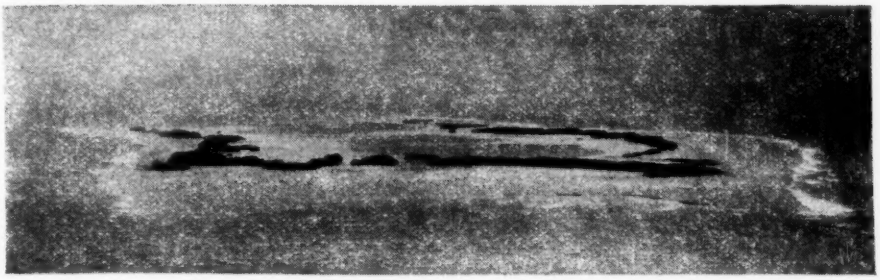

Fig. 3. A coral atoll in the Pacific. Most of Uncle Sam's new islands look something like this.

Guamanians have been subjected. Thick-walled houses with balconies where the more well-to-do town-dwellers live were Spanish in architectural design. Most of these were destroyed by shelling and will probably be rebuilt in American style. The long rule of Spain which zealously and rigorously propagated the Christian religion is also reflected in the large number of churches. Baseball grounds, beer taverns and automobiles reflect the newer influence of the United States. In remote parts of the island, native shacks constructed of bamboo and thatched with coconut leaves are homes of people less affected by foreigners.

The inhabitants of the other islands show relationships to their nearest neighbors on the south and south-east. Those of the Palau, the most westerly, have a Papuan-Malay strain possibly inherited from contacts with Halmahera to the south. The Marshallese, in the easternmost islands, show affinities with the Gilbertese south of them. The natives of islands in between apparently have varied racial relationships.

The volcanic island of Ponape in the eastern Carolines is in great contrast to the atolls. Its size and height lend themselves to a varied topography and lush tropical vegetation. The Ponapeans

are basic Micronesian stock with some European admixture. They may also have inherited a Malayan strain from Filipino exiles, many of whom were sent to this island under the old Spanish regime. They have less facial hair than the Marshallese. Ponapean women appeared to our occupying forces in a great variety of rags below the waist, many with the upper parts of their bodies bare. The primary need for clothing in their sunny climate is conceal-

Fig. 4. Thatching a native house with sugar cane leaves in American Samoa. The author was a guest in this house for a month. Photo by J. W. Coulter.

ment. They were ashamed to appear this way because of the mission taboo on nudity, but they had no other choice. Natives on their island were poor despite the richness of the island, due to exploitation by Japanese military forces. Japanese plantations of coconuts, tapioca and other foods were on the best land, leaving the poorer areas for native cultivation.

Tho of varied origins, the Micronesians in common with other native peoples of the Pacific are confronted by similar problems, and show the same psychological reactions to western governments. Buccaneers, whalers, traders, and missionaries have all had a hand in changing the indigenous cultures to a bewildering mixture with, however, a strong "primitive" base.

Various governments have had a hand in shaping their destiny. The Marianas were discovered by the Spaniards in 1521, the Carolines by the Portuguese in 1527, and the Marshalls by the Spanish navigator Saavedra in 1529. Spain bloodily conquered and oppressed the high-spirited Chamorros of the Mariana Islands, but did not take much interest in the people of the other two groups. In the latter part of the nineteenth century a new German empire was pushing into the South Seas. Germany grabbed the Marshalls as a Protectorate in 1885 and laid claim to other islands. After the Spanish-American war, when the defeated nation ceded Guam to the United States it sold the remainder of the Marianas and the Carolines to Germany. Immediately after World War I broke out in 1914, a Japanese expeditionary force took possession of the German islands.

In appraising the impact of the Japanese administration on Micronesia, it must be remembered that the Japanese officials, like those in any other large scale governmental organization, varied in quality and ability from island to island. On Yap, for example, they had a poor staff, small in number and indifferent to native customs. On Palau there was a large group of officials who were on the average of high caliber, and who took a keen interest in the development of the area. The people of Yap detested the Japanese, as they have most foreigners, whereas the Palauans greatly admired them.

The Japanese gave elementary education thru their own language. This has lessened the aptitude of the natives to speak in pure form the various indigenous languages of the islands. As a result of the efforts made to spread the language, most of the younger generation of islanders today can use Japanese in their

daily affairs. All of them use Japanese words in their own languages, terms for airplane, submarine and others, for which, of course, they have no equivalents. Tinges of Occidental civilization have been perpetuated largely by Christian missionaries from Spain, Germany and the United States who were allowed to remain in the islands after they were mandated to Japan. They have won the great majority of the people to either the Protestant or the Roman Catholic faith, altho native religions or vestiges of them are still practiced.

Economic Problems

Economic problems are fundamental in these newly acquired possessions in the far Pacific. The Japanese developed the resources of the islands to an extent far greater than is likely to be achieved under the rule of the United States. There was a flourishing sugar industry in the Marianas where thousands of acres were divided among tenant farmers who sold their cane to the controlling company. Mining bauxite for aluminum and phosphate for fertilizer were among other economic activities carried on. The copra industry was pushed to furnish coconut oil for the home market. Thousands of tons of fish, taken annually from island waters, were exported to help fill the Japanese food basket. Some 70,000 Japanese men, women, and children lived in the islands, a number considerably exceeding that of the native people. The natives benefited from the economic exploitation, for they were glad enough to earn a few yen now and then when they felt like it. Like all natives of the South Sea Islands, they prefer leisure to money. The Japanese have now been shipped home, and with them has gone the high standard of living enjoyed by the natives. The Micronesians, knowing that the United States is much more wealthy than Japan, look to us expecting that we shall do even better for them. "We did not start the war," they argue. "Why should we be made the innocent sufferers?"

The economic rehabilitation of the islands has been made difficult because of the devastation wrought by the war. Even the terrain of some of the islands has been altered by bombardments. Villages have been rebuilt, not on their old sites, for some of them could not be found, so great was the demolition. Thousands of coconut palms were torn to shreds, copra warehouses blown to pieces, and wharves destroyed.

The benefit that the natives at first missed most was the medical service furnished by the Japanese. Health and sanitation problems were the more pressing in these islands, as they are thruout the length and breadth of the Pacific. Since the end of the war the

FIG. 5. Uncle Sam's new nephews in the Marshall Islands take to our national pastime at one of the schools sponsored by the United States Navy. They make bats and balls from pandanus and coconut trees. Courtesy *The New York Times.*

Navy has done a remarkable job in greatly reducing the number of cases of yaws and other diseases. Among the medical facilities provided is a hospital ship which has been converted into a floating medical laboratory to minister to the needs of the Micronesians under naval administration. A leper hospital is planned for the island of Tinian, north of Guam.

Administrative Problems

Administration problems are difficult to solve, for people in the United States have not had much experience in dealing with so called primitive people. Only on our Indian reservations have a few anthropologists and others had opportunities to learn. Situations have already arisen which demonstrate the gap between our way of thinking and primitive psychology. Some of them have to do with our attempts to introduce democratic processes among people ruled in theory by alien governments, but in fact by their own chiefs. The system of government in Pacific islands is generally referred to as indirect rule—a method by which chiefs are given a large measure of responsibility. When our Civil Affairs officers took charge on some islands, they decided to hold popular elections. The highest chiefs were, of course, always elected, tho in one case at least, the senior chief was an official who presided only on ceremonial occasions, and had no administrative authority without the concurrence of several chiefs of lower rank.

The prestige attached to wearing western clothes has baffled efforts to govern people whose ways of looking at things are so different from ours. During a visit to Fiji I noted that native clerks in the government service were not allowed to wear trousers. When we occupied the Marshall Islands, the people were so destitute of garments that the navy decided to hand out a hundred pairs of pants. Those entitled to receive them were designated as workers, widows and orphans, and others in need of covering their nakedness. Four native clerks who distributed the jeans gave, as a matter of course, a pair to each chief. Shortly afterwards a high chief appeared at army headquarters wearing the new trousers. He was immediately recognized by an officer who demanded, "Are you, the highest chief on this island, one of the needy who must have clothes? Does not most of this island belong to you?" The chief, much nettled, walked off in a huff.

Government by taboo is an instrument of administration respected by native people in the Pacific islands but which has no part in western methods of government. It has been one of the more extraordinary and powerful institutions of government and social welfare in enforcing native rules and regulations among most South Sea people. The taboo, a sacred interdiction laid upon the use of certain things and the performance of certain actions, was enforced

because of the belief of South Sea people in occult powers ascribed to both chiefs and priests thru which a dire fate befell transgressors. In some archipelagoes it was taboo to leave cast off clothing, fingernails, hair or human excreta exposed on the ground. If such were done the culprit believed that a personal enemy could cast on the offending material a wicked spell which was immediately transferred to the transgressor. Such belief in witchcraft or sorcery was, therefore, a powerful influence for sanitary conditions. Since superstitions have been to some extent dispelled, sanitation has been a pressing problem in the Pacific islands. It must be emphasized that sorcery is a native means of social control, of making people conform to generally accepted rules of conduct. And one reason why it is difficult to suppress entirely is that natives have little understanding of and, therefore, small respect for European methods of maintaining law and order with which administrators try to supplant it.

The reactions of natives of Pacific islands to circumstances and experiences entirely new to them sometimes make them appear to us to behave like children. They are unfamiliar with our civilization, our attitudes, and standards of conduct, just as we are with theirs. It is difficult to dispell the general belief that our ways of living and thinking are superior to their manners of life. Yes, they are for us, but not necessarily for them.

Security Problems

The security problem in Micronesia occupies the attention of the largest number of citizens of the United States, for the only justification for controlling islands there is to defend the American continent. However, the next war, if there be another war, will probably be fought with atomic bombs attached to rockets set off thousands of miles away from their targets. They will be launched from platforms which will be the objectives of espionage prior to and during the struggle. The best platforms are battleships, the locations of which could be rapidly changed and their positions, therefore, concealed. Experiments with rockets indicate that they can be projected so far that the distance from the target may be an unimportant factor. Launching platforms in Arizona, Montana, or Alaska might serve for any potential enemy. The positions of all these islands are marked accurately on maps, so they would be easy targets for neutralization. In another war, therefore, island bases

may not be very important. However the United States could not but claim the former Japanese mandated islands, for their occupation cost us so much in human lives and financial expenditure. Moreover no other country expressed any desire to have them.

America's request for a strategic trusteeship in advance of a Pacific Peace Conference was in part to settle the indeterminate status of the islands which prevented the initiation of any economic betterment and held back the business of government. At first in some of our actions towards the inhabitants, such as duties against copra and other goods, the exchange of the yen, public funds captured, we defined the natives as enemy nationals. In certain other spheres, as in rehabilitation, we treated them as neutrals. The United States assumed full responsibility for them under provisions of the laws of war for the occupation of neutral territory. According to a decision by the Department of State in December, 1946, the natives were not enemy nationals, but "inhabitants of a mandated area," and as such entitled to consideration for war damage claims. The formal establishment of a trusteeship over the islands paved the way for the final settlement of these troublesome problems.

The President of the United States on July 3, 1947, recommended to the Eightieth Congress that it pass legislation in the form of a joint resolution authorizing him to approve the trusteeship agreement for the former Japanese Mandated Islands (to be known as the "Territory of the Pacific Islands"). The President pointed out that the terms of the agreement conform with the policy of the United States and with its obligations under the United Nations Charter, and that its terms amply provide for the political, economic, social, and educational development of the inhabitants of the trust territory, and at the same time protect the security interests of the United States. On July 14, 1947, the Senate completed the action initiated by the House of Representatives, in passing a joint resolution, "Authorizing the President to approve the trusteeship agreement for the Territory of the Pacific Islands." As mentioned above the area is now known as "The U.S. Trust Territory of the Pacific Islands."

Future Government

The question of the future government of Micronesia involves also the status of Guam and American Samoa, both of which

the Navy has governed since the Spanish-American war. The United States is the only power in the Pacific islands which carries on naval administrations. In Guam, however, the Navy has from time to time trained the Chamarros for some measure of self-rule. There have been at irregular intervals three Guam Congresses elected by Guamanians. The first two were merely advisory; the present one, at first advisory, is now legislative by recent navy action.

Various policies in regard to training for self-rule in Guam have been representative of fluctuating policies of governments of

Fig. 6. A village scene in Micronesia. Photo by David McNeil.

South Sea islands in general. Terms of Governors are short and there has been no continuity of policy. The people of Guam have a peculiar international status for they have never been granted citizenship in the United States. Unlike the Filipinos they have shown no desire for independence, and are inclined rather to plead for recognition as American citizens. They want to be relieved of a restlessness which has developed under a system in which they feel they have had an insufficient measure of control over their own affairs, and which provided inadequate scope for abilities and powers of leadership. The situation in British Samoa may also lead to restlessness in the American sector. British Samoa has been accepted as a trusteeship under the United Nations with New Zealand as the trustee. The natives, objecting to this, lodged a for-

mal protest with the United Nations, and requested self-government. A committee of investigation appointed by the United Nations with the consent of New Zealand has recommended a large measure of self rule. This will, undoubtedly, lead to repercussions in American Samoa which comprises the eastern islands of the archipelago, altho during a visit of four months in 1937 and a shorter stay early in 1941, I found little sentiment for self-government. The Navy was furnishing the natives with a good medical service, the thing that they prized most.

Naval administration will continue in Micronesia until the President of the United States designates another agency of the Government to take over native affairs. Day to day problems are calling forth the best efforts of naval administrators, many of whom, sincerely interested in native welfare, are co-operating to the utmost. The naval governor, within the framework of his directive, will see to it that the people under his jurisdiction are given every opportunity to develop political, economic and social institutions. This has been assured in article six of the Trusteeship Agreement. On all the islands native administration is kept separate from the administration of troops and naval affairs.

Two outstanding measures have been carried out to assist the government of Micronesia. A School of Naval Administration has been established at Stanford University in California where naval officers are trained in anthropology and other subjects pertaining to native affairs in the islands. The National Research Council, with the close co-operation of the Navy, sent some forty anthropologists, geographers, and linguists to Micronesia in 1947 and 1948 to make a co-ordinated investigation, one of the major objectives of which was to gather data for the improvement of administration. An Organic Act, drafted in the Department of State, was introduced into the House of Representatives in April 1948, but it is not likely that any decisions regarding it will be made for some time.

The aspiration of native peoples for self rule is one of the factors of disquietude in the world today. It is not likely that any of them could maintain independence. They have to be educated in their own best interests and trained to look after themselves as far as possible. The situation demands from the advisors to native authorities training, knowledge of the psychology and history of the people and constant skill and attention to determine when to

interfere and when to leave well enough alone, when to hasten the development of more advanced methods of government and when to advise a slowing down of processes too rapid to be assimilated. There are no pecuniary rewards to be hoped for by those nations charged with trusteeships. A trustee is in terms used thousands of years ago his "brother's keeper."

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PARÍCUTIN

Ben F. Lemert
Duke University

Location

Parícutin volcano, approximately 212 miles by air and 350 miles by automobile in a west-southwest direction from Mexico City, is located in the state of Michoacán. The edge of the lava flow, near the buried town of San Juan de Parangaricutiro, is twelve miles from the Uruapan highway. The road which connects the highway with the edge of the lava flow is bad. Flimsy wooden bridges just wide enough for a car span some of the mountain streams, while others are crossed by means of two planks. Most of the streams are incised ten to twenty feet beneath the surface. Several miles of the road are thru areas covered deeply with fine ash, while other miles are over sharp rocks which are hard on tires and springs. The streets of one village are just wide enough for a car and the southern exit of that village is similar to a steep stairway. At Uruapan a Mexican taxicab driver will load any number of persons that can get into a new American car, and take them to the edge of the lava flow, waiting until they return from

the lookout hill, for the sum of forty pesos. The driver expects a tip of five or ten pesos and he earns it.

REGIONAL CHARACTERISTICS

The state of Michoacán, in which Parícutin is located, is studded with dormant volcanoes. Tancítaro mountain, the dominating land mass, 13,000 feet above sea level, is surrounded by hundreds of cinder cones similar to Parícutin. From an airplane one can see many areas, covered with grass, grazed by cattle, areas, which by their contours, show they were once lava flows like those that spread over the valley in which San Juan de Parangaricutiro is

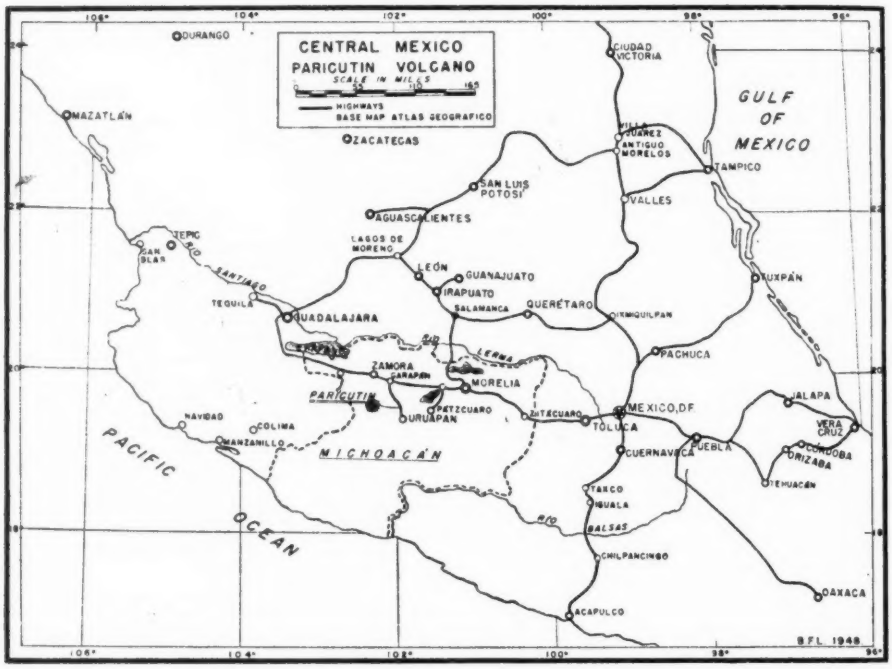

FIG. 1. Central Mexico showing location of Parícutin.

located. The Uruapan highway that starts at Garapán, on the main road between Mexico City and Guadalajara, makes a ten-mile curve around the base of a beautiful cone, the diameter of which must be nearly two miles. The sides of the cones and the surrounding mountains are covered with pine and cedar forests, the intervening valleys carpeted with grass interspersed with fields of corn and sugar cane. This is one of the regions of Mexico that receives plenty of precipitation. Eastward in the vicinity of Mexico City,

and westward around Guadalajara the landscape colors are gray, light green, and buff because of light rainfall, but the appearance of the region around Uruapan is dark green, the landscape color which is so familiar to people of northwestern Europe and the United States east of the Mississippi River.

The People

The Tarascan Indians who inhabit this region live on their corn, vegetables, and livestock. They make aguardiente, a colorless, fiery liquor from their sugar cane. They build their houses of pine lumber, and manufacture a wide variety of wooden objects ranging from furniture to chess sets. The Tarascans are short and stocky. Their black hair is straight, their eyes slant like those of a Mongolian, and their villages resemble those in wooded sections of Japan. Some of the Indians have skin that, where it is not exposed to the sun, is about as white as that of a northern European. These Indians pursue their horses about the high mountain pastures, sometimes running almost continuously for an hour at a time, yet they show very few signs of fatigue in spite of the elevation.

During the summer of 1947 the Tarascans welcomed visitors as a market for their wooden ware and guide services, but did not permit close inspection of their fields. Anyone leaving the highway was thought to be a government agent sent to examine their cattle and

Fig. 2. The trees closer to the volcano that were killed still contain good wood. The Tarascan Indians are skilled in making wooden furniture and novelties. The tourists who come to see the volcano constitute a good market.

goats for signs of aftosa, the disease that livestock-producing countries strenuously try to eradicate. All over Mexico meat animals were destroyed by the thousands while the natives, unable to understand, stood by in helpless ignorance and were kept from violence by the presence of soldiers. The writer was forced to dismantle his camp, established in a mountain pasture twelve miles above Uruapan, in spite of rain and approaching darkness. Between two and three hundred Indians, clad in attractive red and black serapes, and armed with machetes and rifles, told him to come to their village where they could watch him, or remain where he was and be killed.

Prior to the appearance of the volcano, because of very poor means of communication of any kind, this section of Michoacán was subject to very little, if any, law enforcement. Today one Indian may kill another, the body of the dead man will lie where he fell until darkness, at which time members of his village will carry him away, and the perpetrator of the deed may continue his pursuits unmolested. It must not be concluded from this that the Tarascans in this region are vicious or hostile. They are really friendly and generous, but conduct their affairs in the manner that their primitive lives have proved best for survival.

The Volcano

Parícutin has built up a cone, the top of which is about 1800 feet higher than the floor of the valley in which it first appeared in February, 1943. The cone is not circular, but somewhat elliptical, with two sides higher and a sag in the middle. The crater has a central vent and two side vents, all of which sometimes erupt simultaneously. The surface of the cone is covered with volcanic sand, with here and there blocks of lava almost hidden in the loose material. The angle of slope is steep and the sand slides at the least disturbance. Ascent must be made by using both hands and feet, following a zigzag course. The only ways to descend are to double up and slide down on one's back, or wrap the arms around the head and roll. Both methods are uncomfortable and dangerous, especially if one strikes a sharp rock. The writer's companion rolled down that slope for at least 1,000 feet and survived, but such experiences rarely happen.

During violent eruptions the sides of the cone shake and heave and the sand slides. Prior to an eruption the surface trembles con-

stantly and there is a sound similar to that given off by a boiler when the steam pressure is about to lift the safety valve.

Hardened lava almost surrounds the base of the cone, a groove-shaped depression between it and the sloping sand surface. This groove, about twenty feet wide and ten or fifteen feet deep, appears to have been formed by the immense amount of stones of all sizes from that of a pea to that of a piano, that hurtles down the volcano with terrific speed during heavy eruptions. Many of these stones are partially rounded, perhaps their shape being caused by

Fig. 3. Lava from Parícutin rolling over the town of San Juan de Parangaricutiro, Michoacán.

the whirling motion while in a plastic condition in the air, and the pounding they get as they strike the side of the cone and bounce on their way to the bottom.

On the northeast and southwest sides of the cone lava is pushing out continuously and, beneath the broken crust that rides upon it, the molten rock looks like a mass of red-hot taffy. At one end of a graben where the plastic material was squeezing out it looked like a huge red ball or bubble, until the surface cooled and the hardened rock began to crack off. Usually such a situation produces a violent explosion, after which the viscous lava may move fifty or sixty feet a minute. After a few hours, or days, the speed slackens to thirty or forty feet an hour. Close to the cone the temperature of the molten rock is about 1900° Fahrenheit. At a distance of half a mile it usually registers about 1700°. However,

new lava may burst up thru old flows at a distance of half a mile or more from the cone.

The former lookout hill that was used by tourists in 1946 has been completely surrounded by lava, preventing approach by the horses used for the ride from the edge of the lava flow at San Juan de Parangaricutiro. The present lookout hill is two or three miles from the base of the cone. Both hills are covered with a nine-foot layer of fine dust. At the base of the hills, on the side next to the volcano, the lava stands up like a wall, thirty or forty feet high. There are repeated explosions in this wall, each outburst announced by a blast of hot gas and dust, followed by rocks which crash to the bottom. All of the area between the lookout and the volcano is covered with merged tongues of moving lava, the surface of which is far from level. At frequent intervals there are deep grabens where the molten material has drained away, causing the solid mass to collapse. Decent into and the climb out of these depressions is very dangerous because many of the huge blocks of rock are delicately balanced and crash downwards at the touch of a hand or foot. All of the rocks are hot, those in some of the grabens too hot to touch with the hand. The rocks that make up the lava, for the most part, resemble coke material, hard, glassy, with a grayish, sponge-like appearance. Some of the material is solid, dense, porphyritic, and dark gray in color. There are also pieces of red material almost like burned clay, but full of gas holes.

At first glance when one is crossing the great heaps of debris, the rocks seem to be standing still. If he stops to rest, the rocks on which he stands, tilt; they sink a little, and move forward. Sometimes, when stepped upon the rocks sink several feet while others fall in to catch the legs unless the individual is quick enough to shove other rocks into crevices to hold the big ones back. During the afternoon, when thundershowers are prevalent, large columns of steam shoot skyward whenever a heavy fall of rain strikes the hotter portions of the lava beds. In addition to the heat remaining in the hardened portions, beneath much of the area is the still plastic rock which instantly turns the rainwater into vapor. For one who ventures across the lava field, in addition to the danger of being caught in the collapsing rocks, crushed by falling rocks as he climbs into and out of grabens, or scalded by live steam during a heavy shower, there is always the promise of a violent explosion from below.

An Eruption

Parícutin erupts frequently, but there is little regularity in the time between eruptions. A year ago last summer, it erupted violently all one night. The writer's camp on the side of a mountain twelve miles away was shaken repeatedly. The following day the only sign of activity was a cloud of smoke welling up from the crater. At that time two students climbed to the crater and took pictures, none of which were very clear because of the smoke. Last

Fig. 4. The lava from Parícutin now covers more than sixteen square miles of land. Eruptions may occur every few minutes or may be separated by many hours. The lava still pushes out from the northeast and southwest sides of the cone. The large volume of material that is blown from the crater is solidified before it strikes the earth.

August the volcano remained quiet during the three or four hours necessary to cross the lava field. It was not until the author was about 500 feet from the top of the cone that another eruption occurred, an exceptionally heavy one, no doubt due to the hardening of the crust in the crater and the accumulation of immense pressure.

The eruption was announced by a deep rumble from beneath the quaking surface of the cone, the rumble closely followed by a booming explosion. The sound is not like that of a cannon, but prolonged as tho the discharge comes from great depths. An enormous mass of smoke, cinders, and rocks, punctured by great gashes

of fire or bright, red-hot lava, rolled over the edge of the crater. Much rock material was blown high into the air, some of it exploding during the ascent. It takes some of those rocks eleven seconds to fall. For a few seconds after the eruption there was stillness. Then came an increasing volume of sound like a great wall of water rushing down a canyon. Twice during that short period the sides of the cone heaved and threw the writer far down the slope with

Fig. 5. The hills close to the cone are covered with a layer of fine dust more than nine feet thick. Surface flow from heavy rains cuts miniature canyons in this dust, many of them deep and narrow with perpendicular sidewalls. Where the dust is only a few inches deep, the land produces better crops than before the volcano began its existence in February, 1943.

each movement. Sand rolled over him and all around, and then came the rocks. Some of them were large and whirled and whistled as they flashed by. Others, small ones, were like a hail of whizzing bullets. To these sounds was added the heavy thump, thump, of rocks falling from high in the air. Some of those rocks disappeared in the sand. Others skipped as tho over the surface of water, and shot by with a shrill whine.

When all the rocks had finished their movement down to the groove at the base of the cone, the silence was oppressive. Clouds of smoke rolled slowly overhead. Everywhere was deep twilight. The volcano, extending up into that dim light was magnificent. The musical tinkle of the slowly moving lava in the background sounded like thousands of little glass bells.

Economic Effects

Parícutin has destroyed San Juan de Parangaricutiro and the village of Parícutin. It has covered up many fields that formerly provided means of subsistence for the people inhabiting the valley. The primary effect was disaster and despair. The result has proved to be somewhat of a blessing. Farther back from the volcano a large area that was covered with a few inches of fine ashes is now producing better crops than ever before. Much of the timber that appeared dead has put out leaves and is apparently as good as ever. The dead trees, closer to the volcano, still contain good wood. Many of the Tarascans are skilled in making lacquered wooden ware, wooden novelties and furniture. The crowds of tourists that come to see the volcano constitute a good market. At the point where the tourists have to use horses to get to the lookout, little shacks containing food and drink counters provide a good income for people who, a short time ago, saw their lands and homes disappear beneath masses of cinders and creeping rocks. The Indians who have horses rent them to the tourists and act as guides. If an Indian has only one horse he can make at least two round trips to the lookout, daily. The charge per trip is fifteen pesos. If he has several horses, his income is considerable. When the lava-covered land was an area of corn and sugar cane, his income, at the most, would have averaged about three pesos a day.

In Uruapan, which has long been a tourist town, noted for its lacquer ware, its aguardiente de caña, and its beautiful scenery, all business has increased, from hotels, taxicabs, and shops, to the individual workers. Many people have more money than they ever had before, and they work less for it. If that twelve miles of road out to the edge of the lava flow did not remain in a dangerous condition, and the small turn-off sign on the main highway were not kept unreadable, the tourists could drive to the edge of the lava flow themselves, and spend their time in far more comfortable hotels in Morelia.

THE STORY OF FRUIT

ADELAIDE BLOUCH
Hayes School, Lakewood, Ohio

The Fifth Graders were reading in their geography books about the fruit migrants in California. Our librarian read to the class from *Blue Willow,* a charming story by Doris Gates, about an itinerant American family. The children were interested in this way of making a living and so it was suggested that they try to make up stories about *Following the Fruit.* The boys and girls soon discovered that they did not know enough about the kinds of work involved and the times of harvesting the different crops. The librarian tried to help them but it was quite a problem.

Then it was suggested that they might write to other boys and girls for the information. The children had been collecting labels from fruits and vegetables packed in the West so each one chose a different place. They talked over the kinds of information for which they would ask in writing their letters. Each letter was addressed to a fifth grade class in care of the Board of Education of the city selected.

About one-half of the class received answers. As might be expected, the replies varied greatly in value. Along with the letters some classes sent maps, market reports, and other published information secured from Agricultural Bureaus and Chambers of Commerce. We appreciated all of the material sent to us and have edited some of it so that we may have it in a more usable form.

FROM WILLOW GLEN SCHOOL, SAN JOSE 10, CALIFORNIA, TO MARYLYN

"Some children in our room are writing stories about fruits and vegetables. We have some labels we are sending you for your project. Our class is also sending you some dried fruits like prunes, figs, apricots, cherries, and several others. We hope you are going to be pleased with these things. We also have some information from the Chamber of Commerce in San Jose. We would like to have some information about the state of Ohio."

Climate. "You wanted to know about the climate of California. Here is some information about it.

"California has most every kind of climate. We have a lot of rain in the northwest part. It's very dry in the southeast part, the

Mohave and Colorado deserts. It's cold when it snows in the high Sierra Nevada Mountains. The hottest place in the United States is Death Valley. The temperature is 134 degrees above zero. The Central Valley is sometimes over 100 degrees above zero at midday in the summer. Along the coast, it is cool in summer and warm in the winter.

"Here is some information about San Jose climate. Our winters are medium cold with one month of quite cold weather, as low as 31 degrees and 32 degrees above zero. In the summers, it is warm but not too hot. The highest temperature in the summer is about 100 degrees, with a few days as high as 106 degrees. In the rainy season, the months are December, January, and February. In the summer there is no rain."

Canning. "Canning is the preservation of foods in sealed containers by sterilization by heat. In California, the first canneries were established in 1859-1860. Canned fruits are marketed either under the label of the cannery or those of wholesalers or large retailers.

"The fruit is transported from the ranches by truck or train directly to the canneries. Fruit for canning is usually gathered when firm ripe, not quite ripe enough for table use, but full size and good flavor.

"One of the most important factors in determining the quality of canned fruits is careful grading. Most fruits are graded for size by machine before peeling or halving. The fruit is sorted by women at the sorting table; if necessary it is trimmed by hand.

"The first step is peeling of fruits for canning. Peaches are lye peeled after going through an automatic pitting machine. Apricots are halved and pitted by hand. Satisfactory mechanical peelers are now available for pears.

"From the grading machine the fruit passes by means of belts to the canning tables where the women can the fruit according to size and grade. The fruit is then carefully inspected and weighed before the can is automatically filled with syrup. The filled cans are carried by automatic conveyors from the syruping machines to the exhaust room where they are heated in live steam at a temperature of 190 to 212 degrees F. from 5 to 8 minutes. This expels the air from the fruit; also that on cooling, the can will show a good vacuum. The cans are marked as to grade and variety. From the exhaust box the cans pass directly to the double-seaming machine. This auto-

matically places the caps on the cans and seals them at the rate of from 25 to 150 cans a minute. The fruit is then sterilized or processed. This is the most important stage in the canning process. It should be thorough enough to cook the fruit but not to cook it too soft. Immediately after processing the canned fruit should be cooled to stop the fruit from cooking. As the cans are placed on trays after cooling they are stored on the cooling floor overnight. The cans are stored several weeks before marketing in order that faulty cans may be detected. Canned fruits are labeled by automatic machines. The labeled cans are then packed at once into heavy pasteboard cases and are ready for distribution."

Care of Orchards. "Orchards are irrigated every once in a while. The orchard owners dig irrigation ditches and the water comes into the ditches from the wells. If they have no wells they use hose. Sometimes they put paint on the tree trunks to tell the men on the tractors the direction to go when they plow.

"If fruit trees get too much small fruit they thin it so larger fruit will grow there. In order to thin it they cut off some of the small fruit."

How Prunes Are Picked. "The first thing they do in picking prunes is to shake the trees. The shaker takes a long pole with a hook in the end of it and shakes the prunes off the trees. The prunes fall to the ground and the prune pickers get down on their knees and pick them up with their hands. They have pails or buckets to put the prunes in. When they fill the buckets, they take them down to the ends of the lines and dump them into boxes. When they get the boxes filled, the pickers start other boxes. The people who pick get paid a certain amount of money for each box."

Cherries and Other Fruits of Santa Clara County. "Cherries ripen in the latter part of May and the harvest ends in the latter part of June. After cherries there are apricots, peaches, pears, and prunes. Prunes are sometimes dried and the harvest ends in September.

"One-third of the cherries in Santa Clara Valley are sent to the eastern markets fresh. These cherries are packed by hand in Santa Clara Valley. Then they are put in refrigerator cars, ice cold, and shipped back east.

"We thought it might be interesting for you to know that the largest peach orchard in the world is in Merced, California. Del Monte Packing Corporation owns it."

The Story of Canning Pears and Fruit Cocktail. "The first step in canning pears is to store them away in a warehouse until they are ripe enough for canning. Then when they are ripe enough they go thru a machine which cuts their tops and bottoms off. Then they come to another machine which slices them in half and takes the cores out. After the cores are taken out, they are washed and sorted. Then they come down a sort of slide and fall into the cans. Next they slide along a sort of belt and go around a machine where the tops are stamped on the cans. Next they go into a boiler. The boiler is as big as a car and heated hotter than you can imagine. When they are cooked, they are laid sideways and have their labels rolled on and are ready for shipping.

"And as for fruit cocktail, it is the same except there are different fruits in it besides pears and approximately three cherries in each can. So that is the story of canning pears and fruit cocktail."

From Santa Ana, California, to Carole

"Our teacher just read us your letter inquiring about oranges. Over fifty per cent of all the oranges come from California. Santa Ana is in Orange County so we see a lot of orange trees. The Treesweet Company has grown a lot in the past year. There are a lot of packing houses around here. Most of the oranges are sold fresh.

"We grow English walnuts, grapes, and prunes, too. We don't grow grapefruit. Our grapefruit comes from Arizona."

From Jane Addams School, Fresno, California, to Nancy

"We received your letter and thought it was very interesting. Fresno is the heart of the raisin center. The grapes are on vines until they get a certain sugar content of 18 or 20 per cent. The grapes are then picked and put on trays where the sun dries them. After being dried the grapes are called raisins. The raisins are put into boxes, hauled to the packing house where they are put into a steamer. The steamer steams them and cleans them. Then they are packed in 1 to 25 pound containers. After that they are sent to the market where the raisins are sold."

From Riverbank School, Riverbank, California, to Billie

"Our teacher read your letter to us this morning. We were very interested in it.

"We have our fruit tramps here. Many families move from place to place working in the fruit and vegetable crops. There are many large apricot and peach orchards nearby. The principal vegetable is tomato. Walnuts and almonds are grown near our city too.

"Most of ours is either canned or dried. We have large drying sheds here. During the summer a great many children over twelve years of age work in these sheds. Riverbank has a very large cannery and we can all kinds of fruit and vegetables here.

"We hope to hear from you again and would like to hear about Ohio, altho we do not study about other states until the sixth grade. We spend one year studying California."

From Commodore Sloat School, San Francisco, California, to Gordon

"We do not raise very many fruits around the city of San Francisco. Most of the cherries, figs, apples, grapes, peaches, pears, plums, are grown in Santa Clara Valley. The Santa Clara Valley is known as 'The Prune Belt of the World' and Healsburg, 'The Buckle of the Prune Belt.' So many peaches are grown in the Sacramento Valley that this valley is sometimes called the 'Peach Bowl of the West.' Walnuts and almonds are raised also. Most varieties of berries are raised near San Francisco and we enjoy eating fresh berries all summer.

"San Francisco has a few canneries and packing houses which can and pack the fruit raised in the valleys. Most of the fruit is canned, but some is sold fresh. Del Monte peaches are packed by the California Packing Association.

"San Francisco County and the bay region raise many vegetables, some of which are cabbage, artichokes, carrots, lettuce, cauliflower, spinach and chard."

From Madison School, San Francisco, California, to Bryan

"In your letter you asked about corn growing near San Francisco. Corn is grown in some places near San Francisco, but fruits and vegetables are the main crops here. Our irrigated fertile farms are smaller than those of the middle west. Choice fruits are grown in our Santa Clara and San Joaquin Valleys."

From Roosevelt School, Yakima, Washington, to Margaret

"Yes, apples are raised here in the Yakima Valley. In fact some of them are raised right in the city. We have quite a few apple

orchards within the city limits. One can drive for hours and see almost nothing but fruit orchards.

"The Yakima Valley leads the world in the production of apples. Last year of the fifty-eight thousand carloads of fresh fruits shipped from Yakima about twelve thousand were apples. Some of these were Delicious, Winesaps, Jonathans, Arkansas Blacks, and Rome Beauties.

"Other fruits grown here are cherries, peaches, apricots, prunes, plums, raspberries, and strawberries. Most of the fruits are shipped fresh, but some are canned and others made into juice.

"There are many vegetables grown here. Some of these are asparagus, lima beans, beets, celery, carrots, cucumbers, corn, onions, and many others.

"As you probably know, in order to grow any fruits or vegetables here we must irrigate. Irrigation has turned the Yakima Valley from a sagebrush country into a thriving community.

"What crops do you raise in your community?"

From Fruit Valley School, Vancouver, Washington, to Joy

"We have many different kinds of fruits such as pears, peaches, apples, prunes, cherries, and apricots. Strawberries are the first fruit of the season. They are processed for quick freezing. Pears and prunes are the principal fruits canned at the Washington Canners Cooperative in Vancouver.

"Pears come in from all points of the state. They are stored in cold storage and later sorted for them to be put in a ripening room for three days. When the pears are ready for canning they are put thru the peeling machine which peels, halves, and cores them. Then they are washed and inspected for spots, then trimmed. The fruit is then put on belts and brought to canners where they are run thru the syruper, then thru the capper, and then put thru the cooler for nine minutes. They are put in the cooker for thirty minutes. Next they go on an escalator which takes them to the warehouse. There they are cased and labeled for consumers.

"Washington Canners labels, Best West, West Beak, and many more names are pasted on them. The mother of one of our classmates works at the Washington Canneries. She kindly gave us information about the fruit and some labels which we are sending to show you the kinds of fruit and their brands.

"We also raise thousands of pounds of walnuts and filberts. When the nuts fall from the trees we pick them up, sack them and

take them to a dryer. They are dried for about two weeks. They are then sorted and sacked and taken to the stores to be sold. They sell for about twenty-five to forty-five cents a pound. They are very good and we like them to eat in cakes, salads, and candy.

"We hope this has answered your questions. May we hear from you again?"

"Two other girls are writing about fruits and nuts and poultry farms. I will tell you a little about the dairy farms. There are many dairy farms here. They have a hundred cows or more because they are near two large cities.

"Out in a dairy farm they scrub their barn floors. They have electric milking machines which have to be watched carefully. The milk is strained into large cans which are kept covered. Then the milk is taken to the milk house, it is run thru a cooler and then bottled. Then special milk wagons take it to customers and stores. Are you near any dairy farms?"

From Fruit Valley School, Vancouver, Washington, to Barbara

"We are very thrilled to hear from you in Ohio. I am going to write about poultry farms. We have many of them because we have two large cities, Vancouver and Portland, where the people need many eggs and chickens.

"Some of the chicken farms have eight and ten thousand birds. There are turkey farms that have fifteen and twenty thousand birds. It takes many men to feed and care for these flocks. It also takes hundreds of pounds of feed and grain. We surely like the eggs and meat and are glad we can buy these foods. Do you have poultry farms near your city?"

From Columbia School, Wenatchee, Washington, to Bill

"Our class received your interesting letter and would be happy to tell you a little about Wenatchee and our chief industry which is the raising of apples.

"Wenatchee is located on the Columbia River in about the center of the state. Its population is 12,800.

"In the raising of apples we have many problems to contend with. The principal one is the coddling moth or apple worm. We also have to fight scale, aphis, mite, apple frop, etc. All of which we combat with various spray programs. During the late winter

months we prune our apple trees. This is to let sunshine in and allow apples to color better, also to keep the trees from growing too tall and bushy. Later in the spring many ranchers use some form of pollenization to insure a better and more uniform crop. Some use hand methods and some rent bees. Our valley is very beautiful at this time of year. After the blossoms fall and the little apples form, we then have to thin some of the small apples off so the remaining ones will be able to get good size and color.

"Our valley lies east of the Cascade range and, unlike the coast, we get very little rain so we have to depend upon irrigation for water. We have several canal systems on either side of the valley which supply us with the much-needed water.

"Along thru the summer the work consists of spraying and irrigating. As it nears picking time, the apples are getting large and the limbs of the trees have to be propped up with wooden props to help carry the weight. Our apple harvest starts late in September and lasts thru October. The apples are hauled to huge packing sheds or cold storage warehouses where they are washed, wiped, sorted, and graded, and then packed for storage or shipment to market.

"In addition to apples, we grow lots of soft fruit such as cherries, peaches, pears, prunes, and apricots."

"We want to tell you about Washington State's Apple Blossom Festival. It is held each year when the apple trees are in full bloom. From the senior class in the high school a queen and two princesses are chosen for their high grades and popularity. In addition one princess is sent from each district in North Central Washington to represent her own particular community.

"There is a big parade down the main street in the morning. Bands from many places march in the parade. They play gay music as they go by. Floats are entered from different stores, towns, and communities in Washington. On one float the queen, the two princesses, and two flower girls ride. Other floats are decorated to symbolize various things. Cars are also decorated.

"After the parade a pageant is held in the big park below the Court House. A big platform is built. Above the platform seats are built for the queen and princesses to sit on. The crowning of the queen is also held there. In front of the platform sits a band. The story of apples is told in music and dance. At night fireworks are set off in the park. There is also a carnival.

"Do you have any celebrations where you live?"

A number of letters received, asked for information about Ohio, particularly about crops, weather, and kinds of work. To get material to send with their replies, the boys and girls wrote to the Chamber of Commerce, Agricultural Experiment Station, United States Weather Bureau, and various Cleveland industries. We hope that the classes which received our information, enjoyed it as much as we have enjoyed their offerings.

FERTILIZATION: ROUTE TO A NEW CONTINENT

EARL B. SHAW
State Teachers College, Worcester, Mass.

A few centuries ago Christopher Columbus made a long voyage looking for a new route to the riches of the East Indies. Instead he discovered a continent, a land which has added enormously to the world's food supply. Recently, what amounts to the discovery of a new continent may result from widespread use of modern crop fertilization formulae. In short with proper application of nitrogen, phosphorus and potash, crop production can be doubled and the continent of Columbus can became equivalent to two as a producer of food.

One of the most arable sections of North America is the Mid-West Corn Belt which waited until the middle of the last century before starting its great contribution towards American food supply. Commercial farming developed slowly but by the decade of the 1890's, the grain producing qualities of this great farming region became known thruout the world.

In the early 1900's, Professor Cyril G. Hopkins of the University of Illinois, believing that limits of crop production were still far above the yields at that time, discovered that Corn Belt soils lack sufficient phosphorus for a maximum clover harvest. As a result, he developed a plan to increase crop yields and to maintain soil fertility—a plan which included (1) the application of phosphorus to aid clover growth and (2) the growth of clover every fourth year in a crop rotation cycle.

Hopkins was one of the first to advocate the well known four year rotation of corn, corn, oats and clover. The cycle worked well, especially when a heavy phosphate application was made at the time oats were seeded as a nurse crop for clover. If land became

acid, lime was added to correct soil acidity and to permit phosphate and clover to react most efficiently. The lime-phosphate-clover program and the four year and similar rotation cycles high-lighted Corn Belt crop production for many years. Hopkins became famous; students from his classes carried his theories to other Corn Belt universities; farm papers and extension bulletins encouraged the Hopkins Plan. It was regarded as the answer to practically all major crop production problems of the Mid-West.

Modern Fertilization Programs

A few years ago, certain agronomists, who believed the Hopkins Plan good, but not the final answer to increased crop yields, discovered that larger production will result if nitrogen is added to the original Hopkins Plan. Increases from a phosphorus-nitrogen fertilization are almost unbelievable. The use of this combination with oats may be cited as an illustration.

Corn, the principal grain crop of the Mid-West, is usually planted for two or three years on the same field. Then the land may be seeded to oats or other small grain, and almost always clover is planted with it at the same time. Oats shades the clover from the hot sun until the legume gets well rooted and able to make its way alone at the time oats are cut.

Clovers have the ability to take nitrogen from the air and fix that soil builder in the soil, but the task is not started until oats are harvested. Consequently oats, which in recent years has averaged only about thirty bushel an acre in Iowa, gets no help from the crop whose early growth it protects. The old recommendation of applying phosphorus to the oats at seeding time, to help the clover, never did help the nurse crop appreciably because the major deficiency affecting oats was nitrogen. Now when phosphorus and nitrogen are both applied, the oats yield may be more than doubled. One authority sums it up this way.[1] "To help the yield of oats, simply add as many pounds of nitrogen as you want to increase the yield of grain in bushels per acre. One pound of nitrogen adds one extra bushel of oats if that nitrogen is applied in combination with phosphorus, but only if it is applied in combination with phosphorus. Basically the same fertilizing program will hold true with wheat or barley that holds true for oats. The only difference is that because wheat is twice as heavy as oats, it takes approxi-

[1] Personal letter from Garst and Thomas Hybrid Corn Company, Coon Rapids, Iowa, June 16, 1947.

mately two pounds of nitrogen to increase the yield of wheat one bushel, and approximately a pound and a half for an increase of each bushel of barley."

In general, the increases available thru using nitrogen with phosphorus when seeding oats, wheat and barley are also available if such fertilizers are applied to the land at the time of corn seeding. Of course corn yields received a big boost within the last decade in response to the development and widespread use of hybrid seed corn. Largely as a result of this progressive step, corn averages have jumped several bushels an acre within the last few years. But farmers are not satisfied with this progress. Dr. W. L. Burlison, head of agronomy at the University of Illinois, states "The average corn yield here in the heart of the Corn Belt is about fifty bushels an acre. Why is it not more than fifty? The first factor is nitrogen. Put in the nitrogen and you get seventy-five. Add phosphorus and you get ninety. Put in potash also and you get one hundred. When we add nitrogen, phosphorus and potassium for thickly planted high-yielding hybrid corn to normally 90 bushel corn land, the sky is the limit. Under favorable weather conditions yields have already jumped to 150 and more bushels. Our better farmers here in the Corn Belt do not talk any more about seventy-bushel corn. They are shooting at a hundred and fifty bushels and more."

The revolution in crop production brought about by increased use of chemical fertilizers is not confined to the Corn Belt. J. Sidney Cates, writing in the June, 1947 *Country Gentleman*, "War Lessons With Fertilizers" and in a personal letter to the author says that "Corn yields in Southern United States rise to Corn Belt heights when thick-planted hybrid corn is grown in fields treated with nitrogen. In one North Carolina experiment, ten dollars worth of nitrogen pushed up corn yield from 19 bushels an acre without fertilization to 107 bushels with it. Nitrogen not only feeds the crop, but also insures against or cuts down drought damage. Without heavy nitrogen application, a severe drought, coming just as the corn is in silk, has a devastating effect. But put out as much as sixty pounds of nitrogen to the acre, and when a drought does come the corn leaves do not fire. They may curl and look pretty sick, but they stay dark green and alive; and it's in a drought year that the biggest difference shows between no nitrogen and heavy nitrogen."

Mr. Cates also says that "An increase in nitrogen and potash on tobacco and cotton soils with a relative lessening of phosphorus provides increased harvests in the South; and North Carolina soy bean growers have discovered that doubling or trebling potash applications will encourage a big boost in yields."

It should also be added that many people have thought only of the poor lands of the United States when considering fertilization potential. The nation's farmers are now beginning to realize that it may be even more profitable to use fertilizer on the rich lands than on the poorly cropped, eroded and so-called worn out lands of the country.

Much is yet to be learned, however, concerning the best methods of applying nitrogen and other commercial fertilizing materials, and as to what are optimum amounts to be used for highest yields. For example in 1946 at the University of Illinois,[2] corn production tests were made using nitrogen in amounts of 20-40-60-80 pounds of elemental nitrogen per acre and of application by broadcast before plowing, at planting time, at second cultivation, at third cultivation; side dressing at planting time, at second cultivation, and at third cultivation. The fields with the 40 pounds elemental nitrogen applied as a side dressing at the second and third cultivation produced at the rate of 104 bushels of corn per acre, while the field with an application of 80 pounds broadcast at second cultivation and the field with a similar application at planting time only yielded 89 bushels of corn per acre.

Again, old tried and proven practices such as the establishment and maintenance of good drainage; the judicious utilization and careful conservation of legumes, crop residues and animal manures; contour farming; terracing; grass waterways; correction of soil acidity by use of limestone; cropping systems with proper balance between intertilled, small grain and grass-legume sod crops —none of these should be abandoned because of exciting results obtained by the addition of commercial nitrogen, prosphorus and potash. Commercial fertilizers such as these should supplement the time-tested crop practices rather than replace them.

Fertilizer Resources of the United States

One of the main problems facing the farmers of the nation is to obtain, cheaply, enough commercial fertilizer to raise food pro-

[2] AGI150, Urbana Soil Experiment Field Studies, 1888-1946, p. 6, Table 10.

duction to the status of a new continental discovery. The United States supply of phosphorus is large, and prior to the war this country produced more phosphoric acid and phosphate rock than any other country in the world. In four western states, Idaho, Montana, Utah and Wyoming, billions of tons of phosphate rock are available and five states of the Southeast, Florida, Tennessee, Arkansas, South Carolina and Kentucky possess phosphate resources probably less than ten per cent of those in the West. Because the deposits of the Southeast lie closer to the nation's greatest farming country they account for well over three-fourths of our annual production. Of nearly five million tons of phosphate rock mined in 1941, only about 300,000 tons were produced from the far greater resources of the four western states.

Large supplies of potash are available in the United States, but the greatest deposits also lie far from the market. Two major areas supplied the bulk of the 1941 production. These are the Permian Basin of the Carlsbad section of New Mexico and the brines of Searles Lake, California. Sub-surface brines of the Salduro Marsh near Wendover, Utah contribute slightly to United States production. In 1942 the total national production approximated 617,000 tons of K_2O in the form of refined salts, a great increase over the 1930's 61,000 tons when most of our potash came from Stassfurt, Germany and Alsace, France.[3]

Cheaply available natural occurring nitrate reserves are limited in the United States, but nitrogen fixation plants offer adequate substitute where low cost power is available. However, plants with cheap power are not in abundance at the present time and here is one of the greatest drawbacks to the utilization of the "newly discovered continent."

The present nitrogen fixation capacity of the United States is only about 700,000 tons, and of this amount, something like 70,000 tons are being exported under the rehabilitation program. To show how inadequate the supply of ammonium nitrate is, consider the following excerpt from a letter written by Garst and Thomas Hybrid Corn Company, Coon Rapids, Iowa. "There are about 200,000 farmers in Iowa. Each could profitably use the nitrogen equivalent of five tons of ammonium nitrate on his farm annually. This means that Iowa farmers could profit by using the nitrogen equivalent of something like a million tons of ammonium nitrate. They would, of course, have to use far more phosphorus and potash than they are

[3] Mineral Industries, 1941, McGraw-Hill Publishing Company.

now using to balance it—but they could use something like that much nitrogen."

"As against a potential demand for a million tons. Iowa was able to procure only about 7,000 tons last year (1946) and will only be able to acquire about 12,000 tons next year (1948). In other words only one farmer in every twenty, or thereabouts, could have one ton if it were equitably distributed, and it is not."

"The Iowa situation is only representative of the national picture. Nebraska farmers know even more about the use of ammonium nitrate than those in Iowa. Kansas and Missouri will know as much about it soon. In all four states the demand will exceed the supply for some time. In the whole nation this will probably be true."

Europe is also badly in need of nitrogen. In speaking of Europe's need, the Krug report states: "Altho European production of nitrogen is almost back to pre-war levels, total production abroad is still below capacity, owing chiefly to an insufficiency of coal and electric power." The report suggests "giving high priority to coal and industrial equipment shipments for increased nitrogen fertilizer production in Europe." Another item of the report is also of interest to American farmers seeking increased nitrogen supplies. "Considering transportation and cost, it appears desirable to export nitrogen for increased food production abroad rather than to continue to ship the much greater tonnage of equivalent food from the United States."[4]

Some say that nitrogen fertilizers are as easily available as the air we breathe, the water we drink, and the gas our coal fields can produce, but it must be stressed that nitrogen fixation plants are very expensive. An economical sized operating unit may cost twenty or thirty million dollars and many such units are needed for United States production.

The new continent has been discovered but its blessings wait upon supplies of chemical fertilizer for its own use and that of other continents. Yield estimates made cooperatively by the United States Department of Agriculture and the Land Grant Colleges show that with proper land use practices food production can be increased by 1950 as follows:[5] corn 31 per cent; hay 28 per cent;

[4] Krug Report, *New York Times*, October 19, 1947.

[5] Statistics taken from an address by Robert M. Salter, Chief Bureau of Plant Industry, Soils and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture, at Boston, Mass., Dec. 30, 1946.

wheat 18 per cent; rice 13 per cent; peanuts 20 per cent; sugar beets 17 per cent; potatoes 22 per cent and sweet potatoes 31 per cent. And these probably are not ceiling figures for the future. Many believe that fully fertilized, the agricultural production can easily be doubled. The sooner we get to building the nitrogen plants either by private industry or government enterprise the sooner the new continental discovery will really come into its own.

EXERCISES FOR TEACHING LOCAL GEOGRAPHY AT THE COLLEGE LEVEL

SHANNON MCCUNE
Colgate University

"Geography is the study of places away-to-hell-and-gone-away," so goes a student definition of the subject. This misconception of geography as a study of distant rather than local areas should always be combatted by the teacher if geography is to be a part of training for every-day life. With the integration of geography into social studies at the elementary and secondary school levels, laudable emphasis has been put on study of the local scene. However, in this practice the student, and often the teacher, believes that what is being studied has no relationship to geography but is some vague discipline known as "social studies." There is left the impression, sometimes more firmly imbedded, that geography is the study of "other places."

Considerable emphasis is being placed on local geography, whether labelled as such or not, at the lower levels of instruction. However, at the college level little attention is paid to teaching local geography. Altho I have emphasized in my own research and teaching "distant" geography, I believe strongly in the importance of teaching, where possible, some "local" geography. Consequently the following notes on exercises I have used may be of interest to fellow teachers.

Two specific exercises have been used with some success in connection with different courses at different schools. They serve as examples of the type of exercises which can be profitably assigned to students to give some taste of local geography. The first exercise was used at Ohio State University in a course in elementary economic geography. With the University located in a fairly

large city, Columbus, an assignment on local geography fitted well into a segment of the course dealing with cities and urban functions. The students were given the choice of two alternative assignments:

A. Walk or ride along any street that goes thru the city or starts in the center and goes to the outskirts. As you go make notes or sketch on a map the various activities that take place along the street. Note, for example, the terrain over which you pass, the nature of commercial enterprises, the transportation facilities, the governmental functions, the types of residences, etc. From these notes draw a strip map of the geography of the route along which you passed. From the map and your notes draw up a two page summary of the relationship of the various functions you have seen with their location, with the terrain and with each other.

B. Choose one feature of the geography of Columbus, for example, state government buildings, meat packing establishments, slum housing, high-class residence, grade schools, etc., etc., and *by personal observation* note its distribution. Note also associated features that may be factors in the locations of the features you are observing. Plot the locations on a map of the city. From the map and your personal observation and judgment draw up a two page summary of the causes for the distribution you have seen.

Students were about equally divided in their choices of the alternative assignments. Often a family or personal occupation made them choose B. Many students who commuted from across the city would choose A and would usually make the comment that they had never before "seen" the distribution of functions along the route. In the first post-war year there were in each class one or two students who did their observation from airplanes. The exercises were not treated as term papers, but as assignments for two class meetings. The results varied from excellent to poor, tho the poor students seemed to do much better work on this type of assignment than on a reading assignment. In the class meetings two or three of the papers on features were read and two or three of the cross sections were displayed and commented on. The conclusions drawn were often the obvious ones, but seemed novel or "things I never thought about" to the students. Sometimes the conclusions were false, for example, where an important factor of past importance was no longer visible and thus not considered by the student. Some of the conclusions were naive; the classic was the student who stated that a casket factory had easy access to the market "since there are always lots of dead bodies lying around." Tho this was a simple assignment, some students became intrigued and went into the problems quite deeply. Of prime importance was the taste for observation of landscape features and for use of maps. An interesting by-product was stimulus given to the rest of the quarter's work by this change in pace. Students who had seen

some local geography no longer considered the subject so remote from their daily life.

The second exercise described in this note was carried on by students this fall at Colgate University. The situation was quite different, many of the students were from urban or suburban homes and were set down in a rural landscape. The course was on North America and given on the upper class level. After an introductory section on the continental distribution of geographic elements, the course took up the continent on a regional basis. It was at this break that the following exercise was assigned:

> Join with three of your fellow students to make a team of four men. Adjacent strips, a half-mile wide and seven miles long, going across the Chenango Valley, have been drawn on a master map. Choose one of these strips for your team. On the topographic map (which has been enlarged to a scale of 3 inches to the mile) sketch-map the existing land use. Employ the following categories: woodland, wooded pasture, pasture, hay, wheat, corn, vegetables, minor crops. Correct the topographic map as to cultural symbols: houses, roads, etc. Where possible classify these elements as regards condition and use. Make notations of any other cultural elements. If possible observe soil and land form differences. Have the map give as complete a picture as possible of the observable features in the landscape, both physical and cultural.
>
> Having observed and drawn a map of the strip, write a brief team answer to the question: What relationship is there between the distribution of physical elements in the strip and the distribution of cultural elements.

The students were dismissed from classes for four periods while doing the exercise. On completion of the maps and reports the strips were displayed and a lively class discussion of the results followed. Certain prior concepts (for example, that the valley bottom was the best agricultural land) were exploded (the valley floors were too swampy or had too early frosts for good agricultural use). The fundamental importance of transportation facilities was brought out forcibly. The dynamic character of geography was well illustrated to the students who had observed, for example, the slumping embankment of the abandoned canal, the tottering farmhouses on the isolated uplands and the new pre-fabricated houses along the surfaced highways. As the course progressed with its regional treatment of North America, reference was often made to differences or similarities between the distant regions and the local scene which the students had observed.

These brief exercises on local geography were organized to fit into established course patterns. Other teachers probably have used (or could use) similar assignments adapted to their courses, students and localities. More elaborate exercises or even full

courses on local geography would naturally be desirable, but they are often not feasible. However, even simple exercises such as these on local geography are profitable in geographic instruction. They modify the too prevalent view that geography is a subject devoted to distant places described in textbooks. There is geography in the locality where the student lives. He needs to be made aware of its importance.

ANNUAL MEETING OF THE NATIONAL COUNCIL OF GEOGRAPHY TEACHERS

November 25-27, 1948, Palmer House, Chicago

(TENTATIVE PROGRAM AS OF SEPTEMBER 15, 1948)

Thursday Evening, November 25

6:00 P.M. JOURNAL OF GEOGRAPHY Dinner
For editors of the JOURNAL and members of the Executive Board
9:00 P.M. Executive Board Meeting

Friday Morning, General Session

9:00-10:30 A.M.

Greetings from the Illinois Geographers, Floyd F. Cunningham, President of the Illinois Council of Geography Teachers, Southern Illinois University.

Response, Loyal Durand, Jr., Second Vice-President of the National Council of Geography Teachers, University of Tennessee, Knoxville.

Geography as Seen from the Office of Education (20 minutes). Otis W. Freeman, Specialist for Geography in Higher Education, United States Office of Education. Presented by Claude E. Hawley, Associate Chief of Social Sciences.

Discussion.

Historical Geography in School and College (20 minutes). Russell Whitaker, George Peabody College for Teachers.

Discussion.

Intermission.

10:45-12:00 A.M.

Type of Geography Presented in the Primary and Secondary Schools of England (20 minutes). Neville V. Scarfe, University of London, Institute of Education, Visiting Professor Syracuse University.

Discussion.

Geography in Europe, 1948 (15 minutes). George B. Cressey, Syracuse University.

Discussion.

Friday Noon

12:15 P.M. Yearbook Presentation Luncheon (Sponsored by National Council of Social Studies and the National Council of Geography Teachers)

N.C.G.T. members are cordially invited to any luncheon sponsored by the National Council of Social Studies.

Friday Afternoon

2:00-3:45 P.M. Sectional Meetings

Section 1. Conservation

Chairman: S. S. Visher, Indiana University.

Secretary: Byron K. Barton, Eastern Illinois State Teachers College.

Conservation Education or Tragedy (15-20 minutes). Halene Hatcher, Assistant Specialist for Geography and Conservation, Division of Secondary Education, United States Office of Education.

Geographical Aspects of Ohio's Conservation Laboratory (15-20 minutes). C. L. Dow, Ohio University.

Utilization of Field Areas in Teaching Conservation at the University of Wisconsin (15-20 minutes). Arch C. Gerlach, University of Wisconsin.

Section 2. Field Trips and Tours

Chairman: Pauline P. Schwartz, State Teachers College, New Haven, Conn.

Secretary: James H. Glascow, Michigan Normal College.

Illinois State Normal University Tours (15-20 minutes). A. W. Watterson, Illinois State Normal University.

A Geography Lecturer's Experience with the Marshall Plan for Action Tour (15-20 minutes). George W. Hoffman, Graduate Student, University of Michigan.

The Annual Fall Field Course, Clark Graduate School of Geography (15-20 minutes). W. Elmer Ekblaw, Clark University.

Section 3. Color Transparencies

Chairman: Elizabeth Eiselen, Wellesley College.

Secretary: Carol Y. Mason, University of Tulsa.

Values and Problems in the Use of Color Transparencies. (Results of Color Transparencies Questionnaire), Elizabeth Eiselen.

The Value of Color Transparencies Illustrated. Fred E. Dohrs, Northwestern University.

Discussion: The Future of Color Transparencies in the Teaching of Geography. Leader, Marion E. Wright, Rhode Island College of Education.

Section 4: Gamma Theta Upsilon (National Professional Geography Fraternity)

Chairman: Warren Strain, State Teachers College, Slippery Rock, Pa.

Secretary: Ina Robertson, State Teachers College, Valley City, N.Dak.

Round Table Discussion on Worthwhile Projects for Local Chapters.

Participants will consist of representatives from the following chapters: Alpha Chapter, Illinois State Normal University, Normal; Kappa Chapter, State Teachers College, Valley City, North Dakota; Mu Chapter, Duluth Branch, University of Minnesota; Rho Chapter, Eastern Illinois State College, Charleston.

4:00 P.M. Tea

Friday Evening

6:30 P.M. Annual Banquet and Reception for Past Presidents

Address: On the Treatment of Controversial Topics in Geography, Preston E. James, Syracuse University.

Saturday Morning

9:00 A.M. Geography and World Understanding

Commercial Air Transportation—1948 Version, Dr. G. Etzel Pearcy, System Geographer, Trans-World Airline.

Crisis in World Trade, Dr. Charles C. Colby, The University of Chicago.

Planetary Thrombosis, Dr. Sidman P. Poole, University of Virginia.

Finland—Bridge to the Atlantic, Dr. Eugene Van Cleef, The Ohio State University.

Geography and Community Education in World Affairs, Dr. J. Warren Nystrom, The University of Pittsburgh.

Saturday Afternoon 2:00 P.M., General Assembly

(Attendance at this meeting is restricted to members.)

Announce the winners of the A. E. Parkins and Ellsworth Huntington Prizes.

Our Thirty-fourth Year, Clyde F. Kohn, Northwestern University.

Financial Status of the National Council, John H. Garland, University of Illinois.

The Status of the Interrelationship between Geography and Aviation, Richard L. Tuthill, University of Kentucky.

Survey of Research in Geographic Education, Henry J. Warman, Clark University.

Facilitating the Use of Maps, Katheryne Thomas Whittemore, State Teachers College, Buffalo.

Preparation of the Manuscript for Geography in the High School, Zoe A. Thralls, University of Pittsburgh.

Publications Committee in Action, Melvina Svec, State Teachers College, Oswego.

New Committees, Thomas Frank Barton, Indiana University.

A New Administration, Katheryne Thomas Whittemore, State Teachers College, Buffalo.

Prospects for 1949, Earl B. Shaw, State Teachers College, Worcester.

THE NATIONAL COUNCIL AT WORK

News about Affiliated Organizations

Suitable announcements may be made if the proper officer, or any member of an affiliated organization will send news about meetings directly to the Journal of Geography. Remember that material for any monthly issue of the Journal must reach the editor by the 15th day of the preceding month.

Invitations for 1949

Persons who wish to invite the National Council of Geography Teachers to meet in their city or on their campus should send their letters to President-elect, Dr. Earl B. Shaw, State Teachers College, Worcester, Massachusetts, and Secretary, Dr. Clyde F. Kohn, Northwestern University, Evanston, Illinois.

Accommodations at the Palmer House

ROOMS. Single rooms at the Palmer House begin at $5.00. Double rooms are $9.50 and up. Some double rooms are large enough for cots and rollaway beds. For each extra person in the room there is a charge of $3.50. All rooms are with bath. Reservations should be made early.

BANQUET. Our banquet will be held Friday evening November 26th in the Palmer House at 6:30 p.m. Dr. Preston E. James' address will be "On the Treatment of Controversial Topics in Geography." The tentative price of the dinner is $4.50.

Committee on Preparation of Lists and Bibliographies on Motion Pictures for Geography Teaching

Miss Thelma Waddle, Board of Education, Pittsburgh is chairman of this committee.

The Executive Board has approved the appointment of a committee to prepare lists and bibliographies on motion pictures. The Planning Committee recommended "that this committee be appointed for three years to prepare or have prepared material suitable for publication in leaflet form on motion pictures. Topics should be selected from the following list or from those approved by the Executive Board:

1. A bibliography on the selection and use of motion pictures in teaching geography.
2. A list of companies that produce motion pictures for use in teaching geography with brief descriptions of the type of pictures produced and naming the geographer or geographers serving as advisors."

1949 Budget Committee

Following the precedent of former years, I have asked the First Vice-President, Earl B. Shaw, the Second Vice-President, Loyal Durand, Jr., and the Treasurer, John H. Garland, to constitute the Budget Committee. Will committee members discuss their financial needs for 1949 by letter, and will chairmen promptly answer Dr. Shaw's budget requests?

Thomas F. Barton, *President*